REMARKS

Claims 10-14 are pending.
Claims 10-14 are rejected.
Claims 1-9 and 15-19 are cancelled.

Claim 14 is amended to recite “vector” instead of “matrix”.

No new matter was entered in view of these amendments.

In addition, although the Applicants appreciate the Examiner’s attempts to address the application’s lack of drawings, Applicants are not going to submit drawings for this application at this time. The Examiner correctly noted that patent applications do not require drawings under current US law.

ARGUMENTS

I. Rejection to Claims 10-14 under 35 U.S.C. 112, first paragraph

The Examiner rejected Claims 10-14 under 35 U.S.C. 112, first paragraph as not being supported in the specification, as filed. Applicants disagree with this rejection for the following reasons.

Independent claim 10 is rejected as failing to comply with the written description. Specifically, the Examiner details that the description as originally filed would not adequately describe why the y-location is mapped to audio depth information perpendicular to the 2D video plane. Applicants disagree with the Examiner’s conclusion that claim 10 is not supported in the specification.

It is recalled that the specification on page 8, lines 6-10, discloses an example of a mapping involving an x-location and an y-location between $\{x_i,y_i\}$ and $\{x_i,0,y_i\}$, and a statement saying that the movement of an object in a y-dimension is mapped to audio movement in the depth. Further, on page 3, line 3 to page 4, line 2, also a transformation of a 2D coordinate system to a 3D coordinate system is disclosed, and is cited to in the Examiner as part of this rejection.

The Applicants disagree with the Examiners conclusion that a transformation between $\{x_i, y_i\}$ and $\{x_i, 0, y_i\}$ where a coordinate is eliminated, is not correct in terms of what is being done in the patent application (see page 4, first paragraph of the Examiner's Rejection for this specific point).

First, claim 10 clearly specifies that the transformation is directed from a 2D coordinate system to a 3D coordinate system. Thus, one dimension is added, but not eliminated as interpreted by the Examiner. This is assumed to be clear from the claim language ("transforming the 2D location information to a 3D coordinate system"). In this transform being the first claimed method step, one of the three dimensions remains empty (zero), namely the y-dimension, as is shown below.

Second, when using coordinate system described in the specification; the coordinates in the employed notation: $\{x_i, y_i\}$ describes a position in a 2D coordinate system, whose coordinates are commonly noted as x and y, namely {x, y}. Thus, when performing the described transformation, it is apparent that the position is $\{x=x_i, y=y_i\}$. That is, x_i and y_i are values for coordinates, while x and y are variables.

Likewise, it is clear that $\{x_i, 0, y_i\}$ describes a position in a 3D coordinate system, whose coordinates are commonly noted as x, y and z, namely {x, y, z}. Therefore the used coordinates that this position is $\{x=x_i, y=0, z=y_i\}$. That is, a mapping or transformation is unambiguously disclosed where the y-location y_i is mapped to the z-location or depth, perpendicular to the x-y plane of the screen. Since the x-location is mapped to itself (i.e. it remains unchanged), this mapping is the same as a rotation around the x-axis, from the x-y plane to the x-z plane. The fact that the y-location remains zero after this mapping step is due to the particular described dimension.

Mapping example, in which for easier understanding of the single steps no information is mapped to the y-dimension. It is the next step of the method in which the additional information is added: On page 8 of the specification, it is mentioned that the 2D input value can be merged with a third coordinate to obtain the final 3D coordinate position. The third coordinate is denoted as "depth", since "location.x" and "location.y" already refer to the 2D scene in the screen plane, i.e. width and height (see page 6 lines 32-33). The new third coordinate value is added as the y-location, since this position is empty (zero) after the mapping. E.g.

if the new third coordinate value is denoted as c_i, the resulting position is {$x=x_i$, $y=c_i$, $z=y_i$}. This result is clearly different from Lin's result, as shown below, in that correct depth information is easily obtained, and that additional position information is used as y-information, and not
z-information (depth).

Consequently, claim 10 is assumed to be sufficiently disclosed and this rejection should be withdrawn.

The rejection to Claims 11 and 12 should be withdrawn because such claims depend on allowable Claim 10.

The rejection to Claim 13 should be withdrawn because it should be understood that movement is from the described transformation of the y axis in the 2 dimension to 3 dimension transformation, which is described on page 7, lines 28 to page 8, lines 10. That is, the movement in the y axis is the "vertical movement" is the origin of the terminology the Examiner rejects.

An alternative basis for Claim 13 can be argued if one agreed with the Examiner position that specification did not describe these claimed functions (the Applicants disagree with the Examiner's position obviously); the idea that a movement in the y axis is a vertical movement should be understandable to one of the ordinary skill in the art, "a claim term that is not used or defined in the specification is not indefinite if the meaning of the claim term is discernible. *Bancorp Services, L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1372, 69 USPQ2d 1996, 1999-2000 (Fed. Cir. 2004) (holding that the disputed claim term "surrender value protected investment credits" which was not defined or used in the specification was discernible and hence not indefinite because "the components of the term have well recognized meanings, which allow the reader to infer the meaning of the entire phrase with reasonable confidence")," (see MPEP 2173.02).

Therefore Claim 13 is supported in the specification under either theory presented above.

Claim 14 is supported in the linear algebra operation described in the example on page 8, lines 6-10, where (x, y) is transformed i using the described 2 x 3 vector. Hence, Claim 14 is supported in the specification.

II. Rejection to Claims 10, 12, and 13 under 35 U.S.C. 102(e)

The Examiner rejected Claims 10, 12, and 13 under 35 U.S.C. 102(e) as being anticipated by Lin et al. (U.S. Patent 6,829,018, hereafter referred to as 'Lin'). Applicants disagree with this ground of rejection.

Lin et al. ('018) describes a sound imaging system that receives mono audio data (col.2, lines 53-54), and creates position enhancement data relating to visible objects, which is based on image analysis and which results in depth information. Then Lin processes the mono audio data by adding a depth component according to the depth information, and outputs multi-channel audio data. Lin discloses that the system can also be used for multi-channel audio inputs signals, e.g. stereo signal, without departing from the scope of the invention (see col.3, lines 5-8). Since the presently claimed invention is restricted to 2D audio input, only this case is relevant here. Based on Lin's disclosure, the skilled person will in this case add depth information to the 2D input signal, according to image analysis. Using the above-described notation, Lin enhances a multi-channel audio signal $\{x=x_i, y=y_i\}$ of a 2D space to a 3D audio signal of the form $\{x=x_i, y=y_i, z=z_i\}$. The fact that the added depth information z_i is obtained from image analysis, and in particular the size of an object (see para.0024), can be denoted as $z_i = f(x_i,y_i)$, so that Lin's 3D audio signal is $\{x=x_i, y=y_i, z=f(x_i,y_i)\}$. This is different from the 3D coordinate system of the present invention, as described above.

Further, the following deficiencies in Lin's disclosure are solved with the present invention.

One problem is that Lin does not further describe or specify how to obtain the actual depth value from the height value (corresponding to the function f). For example, some scaling must be applied to the depth information. While a depth of z=0 seems to be defined by the screen plane, a maximum depth must be defined for visual objects that are visible on the horizon, or on the upper edge of the

screen. This is assumingly achieved by the function f, which is however not in detail disclosed. The presently claimed invention however involves a simple, unambiguous way to obtain the depth value. Such correct audio depth value is more important than a correct audio height value, as will be explained below.

Further, Lin's system is only applicable to visual objects. Audio depth information cannot be obtained for hidden objects, e.g. a sound source hidden behind an object, or audio objects that are outside the screen, e.g. behind the viewer. The present invention allows providing audio depth information independent from the visibility of a sound source.

Also, if one would consider the approaches as Lin discloses instead of that claimed in Claim 10, usually some synthetic method is used, which is also the case in Lin's disclosure which uses image analysis, face recognition, voice recognition etc. Therefore, it may be expected that the added information will be rather incorrect. Since the human ear is much more responsive to horizontal audio information (including left-right and front-rear directions) than to height information, errors in depth are more disturbing than errors in height. Therefore it is advantageous to use the potentially incorrect information for audio height instead of depth, as the presently claimed invention does, potentially makes it that errors are less disturbing to the viewer and listener.

Another potentially advantage in the use of Claim 10 is that the resulting audio matches existing multi-channel audio reproduction environments better. These are more optimized for exact reproduction in horizontal directions than in height. This is also a result of the fact that the human ear is much more responsive to horizontal audio information than to audio height information. The invention maps the existing two audio dimensions to the horizontal audio space, which is reproduced more exactly than audio height, even if the added coordinate information is very small or zero.

Hence for the reasons given above, Claim 10 is patentable over Lin. Also, Claims 12 and 13 are patentable, as such claims depend on allowable Claim 10.

III. Rejection to Claims 11 and 14 under 35 U.S.C. 103(a)

The Examiner rejected Claims 10-12 and 13 under 35 U.S.C. 103(a) as being anticipated by Lin et al. (U.S. Patent 6,829,018, hereafter referred to as 'Lin') in view of the article by Scheirer et al. ("AudioBIFS: Describing Audio Scenes with MPEG-4 Multimedia Standard). Applicants disagree with this ground of rejection.

Applicants assert that Claims 11 and 14 are patentable as such claims depend on allowable Claim 10.

In view of the presented amendments, Applicants assert that the presented claims are patentable over the cited art of record.

Having fully addressed the Examiner's rejections it is believed that, in view of the preceding amendments and remarks, this application is in condition for allowance. Accordingly, reconsideration and allowance are respectfully solicited. If, however, the Examiner is of the opinion that such action cannot be taken, the Examiner is invited to contact the Applicant's attorney at (609) 734-6809, so that a mutually convenient date and time for a telephonic interview may be scheduled.

Respectfully submitted,

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